Management Plan for the Aishihik Wood Bison (*Bison bison athabascae*) Herd in Southwestern Yukon

2012

YUKON FISH AND WILDLIFE MANAGEMENT BOARD

Yukon Environment

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Acknowledgments: This management plan was developed by the Yukon Wood Bison Technical Team and other contributors (Appendix A). Planning team meetings were sometimes facilitated by Bob Hayes. Thomas Jung, Linaya Workman, and Karen Clyde led the drafting of this plan, on behalf of the Yukon Wood Bison Technical Team.

Management Plan for the Aishihik Wood Bison (*Bison bison athabascae*) Herd in Southwestern Yukon

Prepared by the
Yukon Wood Bison Technical Team
as recommended by the
Yukon Fish and Wildlife Management Board

Approved by

Currie Dixon
Minister of Environment
Government of Yukon

Aug. 29, 2012
Date

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Photo: Kathi Egli

Background

Taxonomy of Wood Bison in Yukon

Bison (*Bison spp.*) are in the Order Artiodactyla (even-toed ungulates). This large group of ungulates is divided into nine families, representing 240 species. Bison belong to the family Bovidae, which includes 143 species of antelopes, cattle, bison, buffalo, goats, and sheep (Wilson and Reeder 2005). Two extant species of bison are recognized: European bison (*Bison bonasus*) and American bison (*Bison bison*).

Within American bison two subspecies are recognized: plains bison (*Bison bison bison*) and wood bison (*Bison bison athabascae*). The taxonomy of American bison subspecies, however, is controversial. Some authorities argue that wood bison are not a valid taxon distinct from plains bison (e.g., Geist 1991). Proponents of this view contend that molecular and morphological data do not support a clear distinction among the two subspecies and that phenotypic variation is clinal, most likely related to environmental conditions. Geist (1991) suggests that wood bison are best classified as an ecotype rather than a subspecies, however, recent morphological and molecular data suggests otherwise (van Zyll de Jong 1995; Wilson and Strobeck 1999). Definitively assigning an individual to one subspecies or the other, however, is complicated due to phenotypic plasticity, some hybridization, and translocations, particularly within populations in and adjacent to Wood Buffalo National Park. Thus, the taxonomic status of wood bison is likely to remain problematic.

Notwithstanding the controversy, wood bison and plains bison are currently recognized as distinct taxa from a conservation perspective. Within Canada, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), the National Bison Recovery Team, and the federal *Species at Risk Act*, have all retained the convention that there are two subspecies of American bison in North America (Gates et al. 2001).

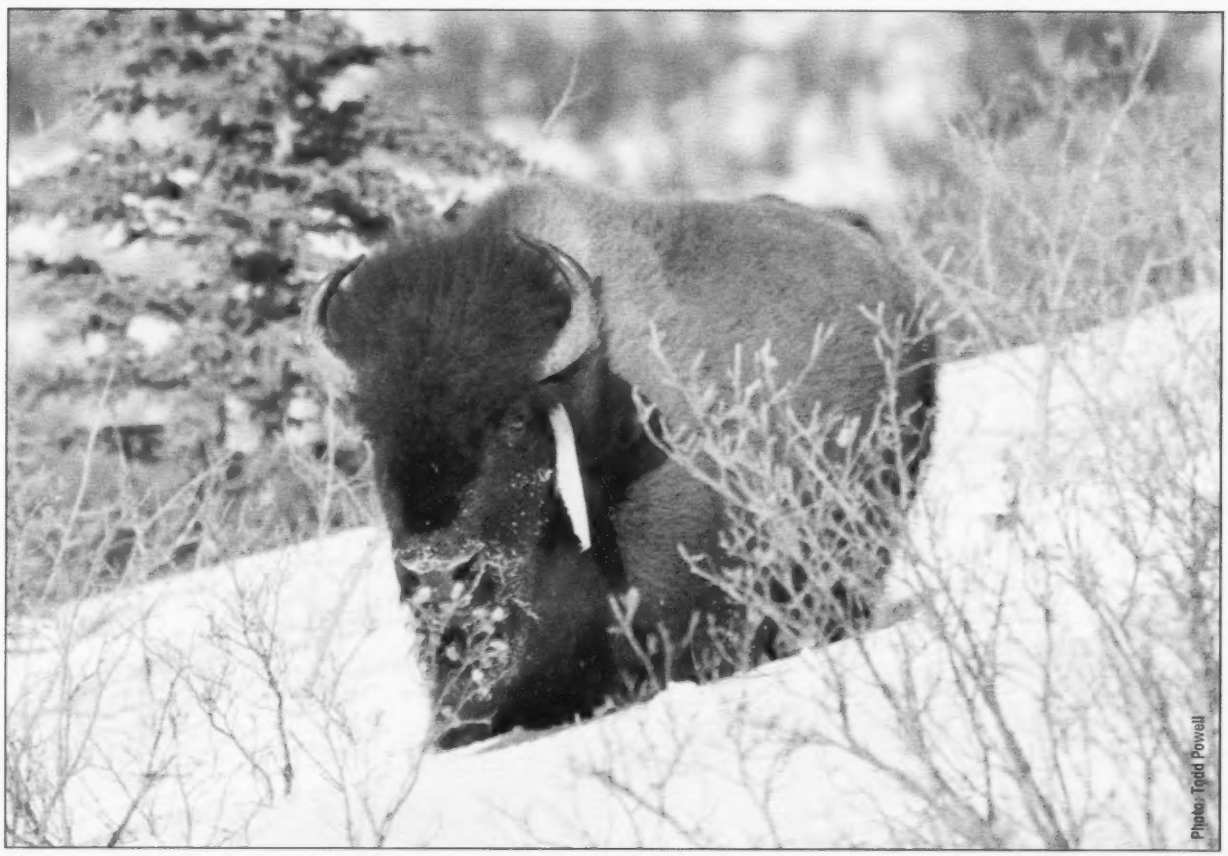
Photo: Todd Powell

Origin and Distribution of Wood Bison in Yukon

The steppe bison (*Bison priscus*) is the ancestoral species of North American bison, and predecessor to the wood bison. Steppe bison first came to North America from Asia via the Bering land bridge, likely more than 90,000 years ago (Guthrie 1970). Along with wooly mammoths (*Mammuthus primigenius*), Yukon horse (*Equus lambei*), and caribou (*Rangifer tarandus*), steppe bison were one of the most abundant large mammals in Beringia during the late Pleistocene. Ice age predators of steppe bison likely include american lions (*Panthera leo*), wolves (*Canis lupus*), giant short-faced bears (*Arctodus simus*), and humans. Substantial fossil evidence suggests that bison persisted in Beringia until recent times (Farnell et al. 2004; Shaprio et al. 2004).

Accordingly, wood bison distribution in Yukon reflects several thousand years of range use according to fossil evidence (Guthrie 1970; Farnell et al. 2004) and historical accounts (Lotenberg 1996). At the beginning of the 1800s it was estimated that there were about 168,000 wood bison across their range (Soper 1941). The decline of wood bison in the late 19th century has been documented, with extirpation in Yukon likely occurring early in the 20th century (reviewed in Gates et al. 2001). Causes for the decline and extirpation of wood bison across their range was likely a response to a gradual replacement of steppe habitats by remnant boreal grasslands, followed by conversion of remnant boreal grasslands to boreal forest, as the climate of northwestern North America gradually became warmer and wetter. Human hunting may have played a role in extirpating small, isolated remnant bison populations, particularly in the late 19th century.

Bison conservation measures were initiated by the Canadian and American governments, as well as a few key ranchers, in the early 1900s. In northern Canada, most conservation focussed on preserving plains bison in national parks created specifically for this purpose (reviewed in Fuller 2002). A series of unfortunate decisions led to the introduction of plains bison into Wood Buffalo National Park in the 1920s, and it was believed that the remnant wood bison population, restricted to the park and environs, had become extinct. The fortuitous discovery, however, of a small, isolated population of wood bison in 1959 in the Northwest Territories (Banfield and Novakowski 1960) lead to the initiation of a concerted effort to conserve wood bison as a taxon distinct from plains bison.

In the 1970s jurisdictions within the historical range of wood bison, in conjunction with the federal government, initiated a wood bison recovery program, under the auspices of the Canadian Wildlife Director's Committee. Since 1980, Yukon has participated in the national recovery effort for wood bison, with the goal to establish one free-ranging herd of viable size. To meet this goal, the Canadian Wildlife Service did a range reconnaissance in 1982 and recommended the Nisling River valley as the most promising release site, potentially able to sustain at least 400 wood bison. In 1983, the federal Minister of the Environment and Yukon's Minister responsible for Renewable Resources signed a cooperative agreement for a wood bison reintroduction project. It tied both governments to work together with the goal of establishing a free-ranging herd of wood bison in the Nisling River valley as part of the national wood bison recovery program. The agreement called for the establishment of an enclosure in the Nisling River valley to first habituate transplanted wood bison to Yukon's environmental conditions. An enclosure measuring about 5.18 km^2 was built in the Nisling River valley in 1985. Between 1986 and 1992, a total of 142 wood bison were transplanted to the enclosure, arriving primarily from Elk Island National Park, but also with some animals from the Metro Toronto Zoo and a private facility in Moose Jaw, Saskatchewan.

Between 1988 and 1992, 170 bison were released from the enclosure in the Nisling River Valley (Yukon Department of Renewable Resources 1998). This recovery effort has successfully established a herd of wood bison that now ranges in the Aishihik area southwestern Yukon (Figure 2). The core range of the Aishihik herd currently extends eastward to the North Klondike Highway, southward to the Dezadeash River, northward to the Nisling River, and westward to the Ruby Range.

Two other herds occur at least seasonally in southeastern Yukon. The Nahanni herd is a transboundary herd that is the result of a wood bison restoration project in the Northwest Territories (Larter et al. 2007). The herd is mostly distributed in the Liard River Valley, from the confluence of the Fort Nelson River in British Columbia to the confluence of the South Nahanni River in the Northwest Territories (Figure 1). While the herd's distribution and range use in Yukon is not well documented, wood bison are regularly sighted along the Beaver and Liard rivers in southeast Yukon (Larter et al. 2007). Another population, the Nordquist herd, is largely found along the Alaska Highway, from Muncho Lake, British Columbia to as far west as Watson Lake, Yukon (Figure 1; Rowe 2007). This population was also part of the National Wood Bison Recovery Program and was re-established as a conservation initiative (Gates et al. 2001).

Photo: Todd Powell

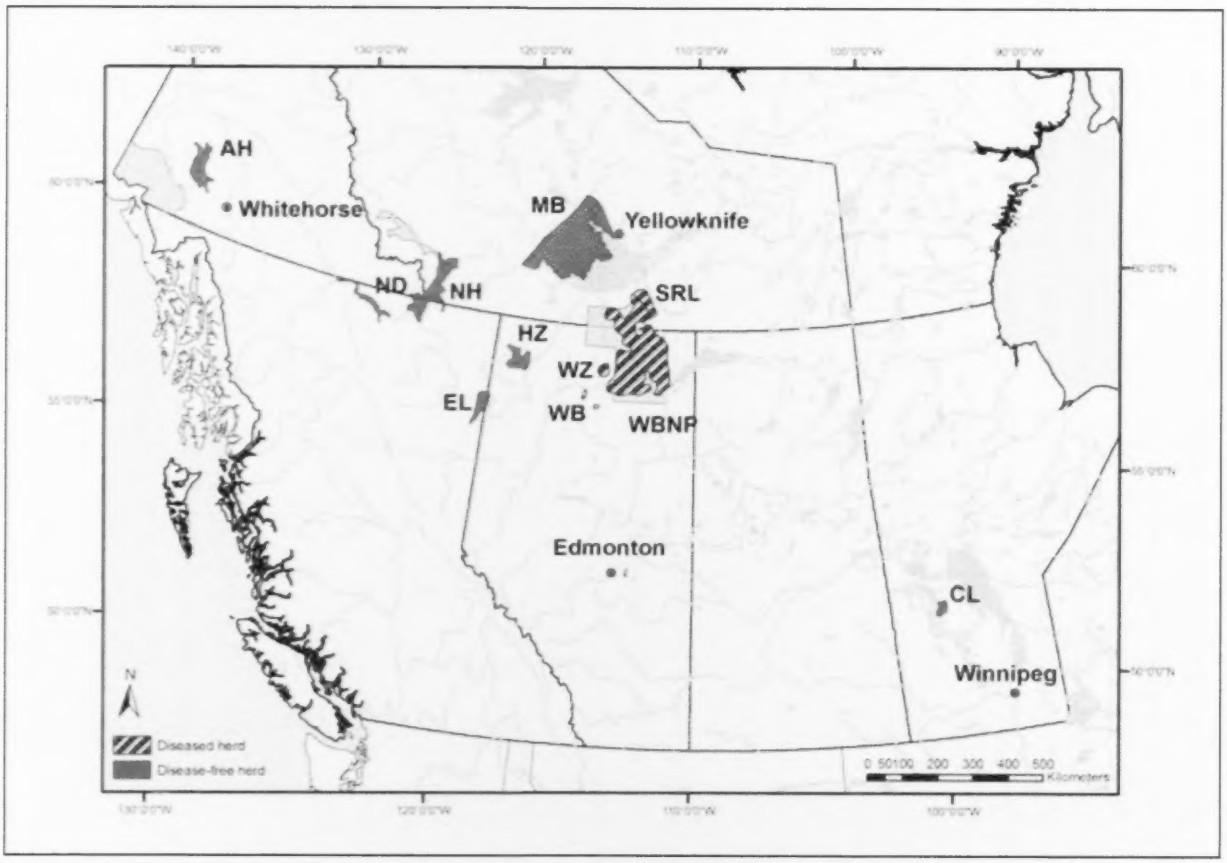

Figure 1. *Distribution of free-ranging wood bison populations in Canada. Herds ranging into Yukon are depicted by the following: AH = Aishihik herd; ND = Nordquist herd; NH = Nahanni herd. Green polygons are relevant national parks.*

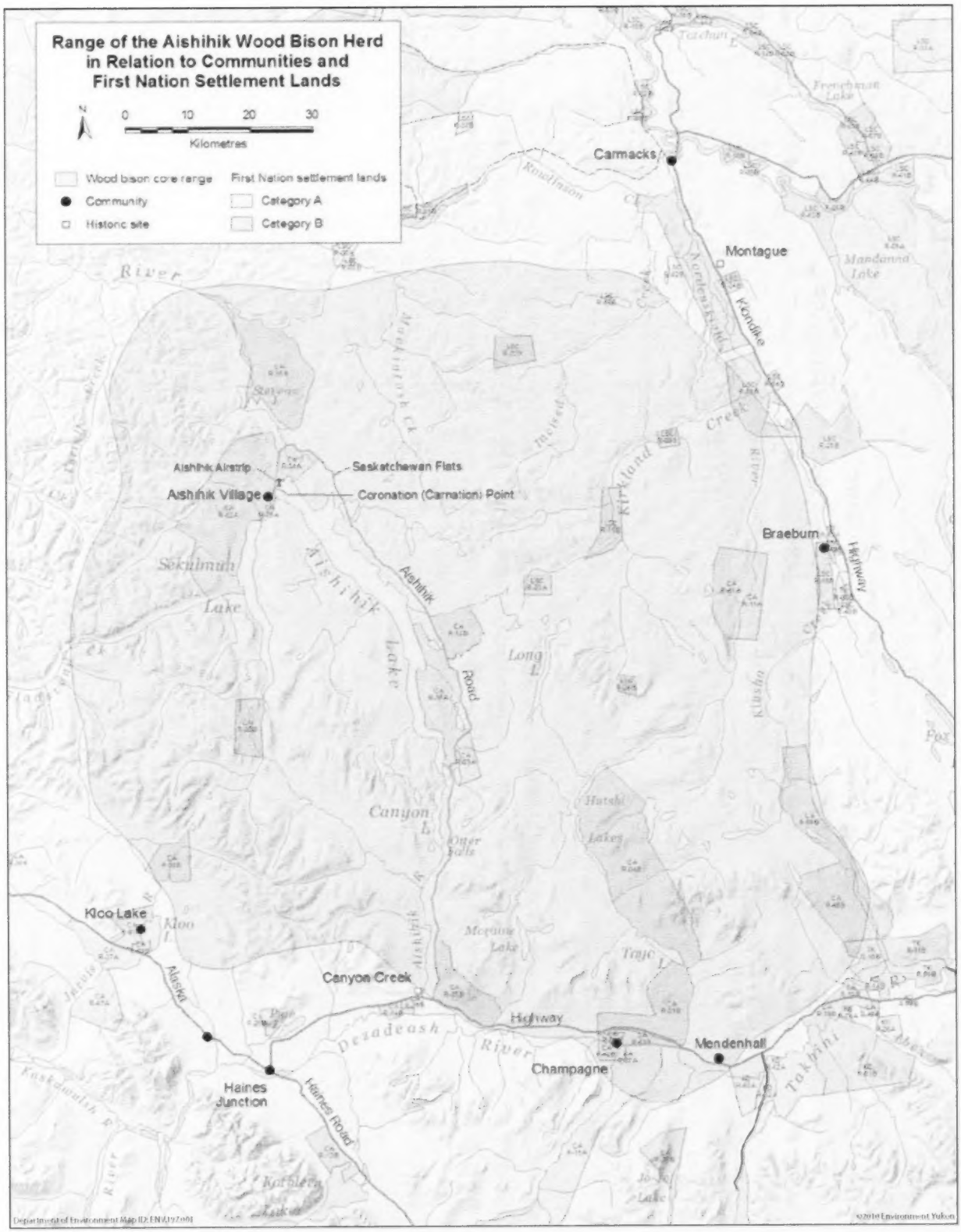

Figure 2. *Approximate current core range of the Aishihik Wood Bison Herd.*

Population Status of the Aishihik Wood Bison Herd

Unregulated by natural predators, the Aishihik Wood Bison Herd grew quickly. For the most part, calf recruitment estimates were in the order of 17–21% per year. Rapid growth of the Aishihik herd is not unique: similar growth rates were reported by Larter et al. (2000) for an expanding wood bison population in the Mackenzie Bison Sanctuary, Northwest Territories and for other herds established in the last 20–30 years in British Columbia, Alberta, and Northwest Territories.

By 1998, it was estimated that the Aishihik herd was close to 500 animals. As per the 1998 Yukon Bison Management Plan (Yukon Department of Renewable Resources 1998), human hunting of the Aishihik herd commenced in an attempt to stabilize, or at least slow down, the growth of the herd. Between 1998 and 2011, 1259 wood bison were harvested from the Aishihik herd (Figure 3). The harvest has provided many Yukoners with a tangible benefit of having wood bison on the land, and likely contributed, in part, to raising the awareness and appreciation of wood bison in Yukon.

Early population counts relied on so-called total counts of the herd (Fuller 1950). These likely were accurate in the early years, but as the population grew and expanded its range, the reliability of total counts became questionable. Beginning in 2005, Environment Yukon began looking at alternatives to total counts, in an attempt to gather more accurate population estimates that were bounded by confidence intervals. In July 2007, the Yukon Wood Bison Technical Team conducted a mark-resight population estimate of the herd, and a population estimate of 1089 (90% confidence intervals = 970–1309) bison was obtained. Building upon this success, the procedure was slightly modified and repeated in July 2009; the new population estimate obtained was 1151 (90% confidence intervals = 998–1335). In 2011 the population estimate obtained was 1230 (90% confidence intervals = 1106–1385). This indicates the herd continues to slowly grow. Census results are provided in Figure 4.

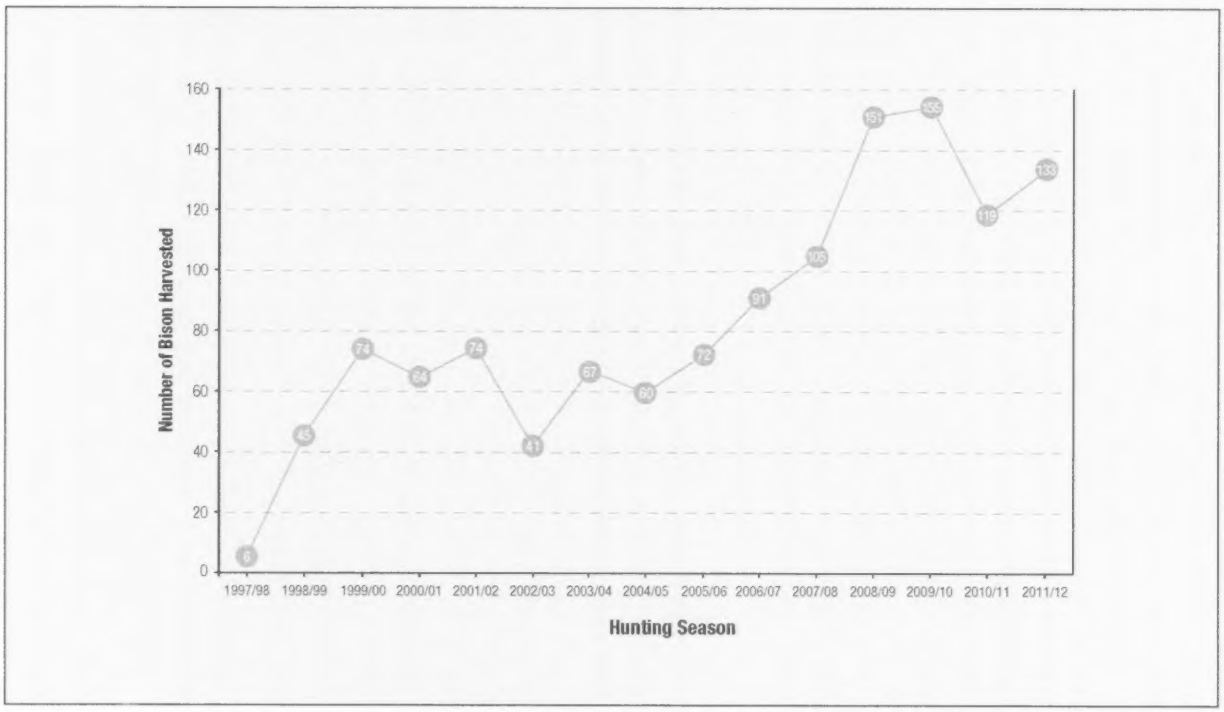

Figure 3. *Harvest of wood bison from the Aishihik herd, 1997–1998 to 2011–2012 hunting seasons, southwestern Yukon.*

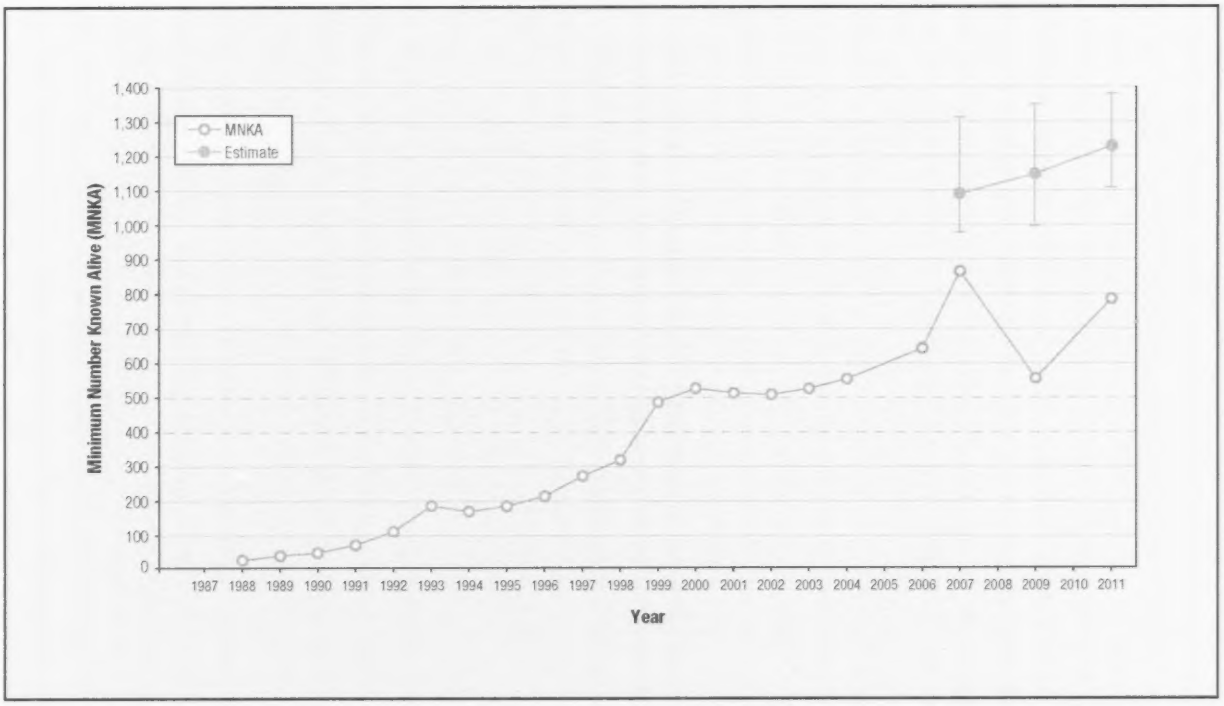

Figure 4. *Population size of the Aishihik Wood Bison Herd. Green circles are total counts (MNKA, minimum number known alive), while blue circles and lines are mark-resight population estimates and associated 90% confidence intervals.*

Conservation and Legal Status of Wood Bison

The conservation and legal status of wood bison is complex. Generally, wood bison are considered a species at risk, both globally and nationally.

From a global perspective, the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species lists the American bison as *near threatened*. *Near threatened* species are those that do not meet the IUCN criteria as *critically endangered*, *endangered* or *vulnerable*, but is applied to taxa that may be close to qualifying as one of those categories. Listing by the IUCN does not imply any legislative restrictions or requirements. The IUCN does not provide a separate conservation status for either the plains or wood subspecies of American bison.

The Convention on the International Trade in Endangered Species (CITES) is an international treaty which regulates the international trade in endangered species, their parts, and products derived from them. CITES formerly listed the wood bison as an Appendix I species, thus essentially prohibiting international trade. In 1997, however, CITES downlisted the wood bison to an Appendix II species. Appendix II species are not considered threatened with imminent extinction, but may become so if trade is not closely monitored and controlled; thus, international trade of wood bison or wood bison parts or products is regulated and monitored, but not prohibited.

The United States Fish and Wildlife Service (USFWS) provides a legal status for select species of conservation concern both within and outside the United States. In 1970, the USFWS listed the wood bison as "*endangered in Canada*" under the US *Endangered Species Act*. This meant that wood bison, their parts, and products derived from wood bison originating from Canada could not be imported into the US. In May 2012 wood bison were reclassified from *endangered* to *threatened* under the *Endangered Species Act* which could provide for some non-commercial import into the US.

Within Canada, wood bison are listed as *threatened* under the *Species at Risk Act* (SARA). Previously, from 1978 to 1988, wood bison were classified as *endangered* by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Downlisting in Canada in 1988 was based on progress towards population recovery and lack of threats leading the species towards imminent extinction. In 2000, COSEWIC re-affirmed its designation of *threatened* based on a status report produced by Ruckstuhl (2000). Under the SARA, automatic prohibitions against killing or harming are afforded for the protection of *threatened* species on federal lands. As well, a national recovery strategy must be produced, including the identification of critical habitat. Wood bison will likely be next assessed by COSEWIC in 2013.

Within Yukon, the Yukon *Wildlife Act* lists wood bison as a *big game species*. Previously, they were considered a *specially protected species* under the Yukon *Wildlife Act*, but once the Aishihik herd reached a population goal of 500 animals in about 1998, they were removed from the *specially protected species* list and added to the list of *big game species*. This change in legal status in Yukon permitted the harvest of bison by licensed hunters, as a means of controlling the growth of the population (Yukon Department of Renewable Resources 1998). Under the *Umbrella Final Agreement* wood bison are considered a *transplanted* species and as such, Yukon First Nations do not have subsistence hunting rights.

Photo: Chris Stacey

Why Develop a New Management Plan for Wood Bison?

A cooperatively developed and publicly sanctioned management plan for the Aishihik Wood Bison Herd ensures that the varied interests in the conservation and management of the population are heard and addressed. The cooperative nature of plan development and implementation, through the Yukon Wood Bison Technical Team and the Bison Management Committee, ensures that varied perspectives on the value and future management of the Aishihik herd are equally taken into account.

This management plan is a working document, based on current circumstances, and it follows that it will be reviewed and updated as needed. Population size, distribution, and habitat use of the Aishihik herd have changed since the development of the previous management plan in 1998. We have had 13 years experience with the annual bison hunt to draw upon, and the 2001 National Wood Bison Recovery Plan (Gates et al. 2001) and the Draft Recovery Strategy for Wood Bison in Canada, 2011 (National Wood Bison Recovery Team, in review) have been developed. Most importantly, the federal *Species at Risk Act* was proclaimed in 2003, and wood bison legally became a species at risk. Some long-standing issues have been resolved, while others have not. In particular, many concerns about the socio-economic and environmental impacts of the Aishihik Wood Bison Herd remain.

The need to balance conservation of a species at risk with the community interests in curtailing the growth of the herd through harvest necessitates an intensive management regime. Promoting population recovery of wood bison, while addressing concerns regarding their restoration, and a strong public demand to hunt wood bison, must be done in a cooperative fashion. The development of a publicly sanctioned management plan is a means of working together to take care of wood bison and deal with the identified concerns.

Scope of the Management Plan

This management plan is intended to provide a broad framework to guide management of the Aishihik Wood Bison Herd, in a manner that is consistent with the Draft Recovery Strategy for Wood Bison in Canada, 2011 (National Wood Bison Recovery Team, in review), while taking into account local interests and aspirations. It is meant to be enabling in approach, allowing managers to work within an adaptive management framework, recognizing that the abundance and distribution of the herd may change, and that there are many things we do not know about wood bison in Yukon, or their impacts. Prescriptive recommendations and regulations are, for the most part, left for later development through working groups or as information becomes available. Many of these initiatives have begun and are anticipated to be ongoing.

This management plan is focused solely on those free-ranging wood bison in southwestern Yukon that comprise what is known as the Aishihik herd. Other herds that seasonally occupy parts of southeastern Yukon are not considered in this management plan (e.g., the Nahanni wood bison herd, and the Nordquist wood bison herd). They will be dealt with in other, parallel planning initiatives for those herds, under the auspices of the Draft Recovery Strategy for Wood Bison in Canada, 2011 (National Wood Bison Recovery Team, in review). Likewise, captive wood bison on game farms and wildlife preserves in Yukon are, for the most part, not considered in this plan and are managed under different regulations than free-ranging wildlife.

The Planning Participants and Process

The plan was developed by the Yukon Wood Bison Technical Team comprised of representatives of Environment Yukon, Champagne and Aishihik First Nations, Little Salmon/Carmacks First Nation, Kluane First Nation, Yukon Fish and Wildlife Management Board, Alsek Renewable Resources Council, Carmacks Renewable Resources Council, Labarge Renewable Resources Council, and Environment Canada. The Yukon Fish and Game Association, Yukon Outfitters Association, Yukon Department of Energy, Mines and Resources (Agricultural Branch), and others also contributed to some of the planning discussions (see Appendix A).

Work on the plan began in February 2004 at a meeting in Carmacks. Subsequent planning meetings occurred through 2004, but for an extended period beginning in 2005 work on the plan was halted. In late 2008, the committee re-initiated work on the plan. By December 2009, the Yukon Wood Bison Technical Team completed a final review of the goals, objectives and actions of the plan and recommended that these go forward for review, after revision of the text.

In March 2010, the Yukon Wood Bison Technical Team recommended the plan to the Bison Management Committee, a director-level committee with representatives from Yukon government (Director of Fish and Wildlife, and Director of Conservation Officer Services Branch), Champagne and Aishihik First Nations (Director of Lands and Resources), and Little Salmon/ Carmacks First Nation (Director of Lands and Resources).

Environment Yukon, on behalf of the Bison Management Committee, presented the draft plan to the Yukon Fish and Wildlife Management Board (YFWMB) in December 2010 indicating a readiness to proceed with a public review.

Beginning in December 2011, with the assistance of two co-chairs of the Yukon Wood Bison Technical Team, YFWMB led a public review of the draft plan that included community meetings in Whitehorse, Carmacks, and Haines Junction, and other opportunites for public input. Following the review the YFWMB recommended a revised plan to the Environment Minister in June 2012.

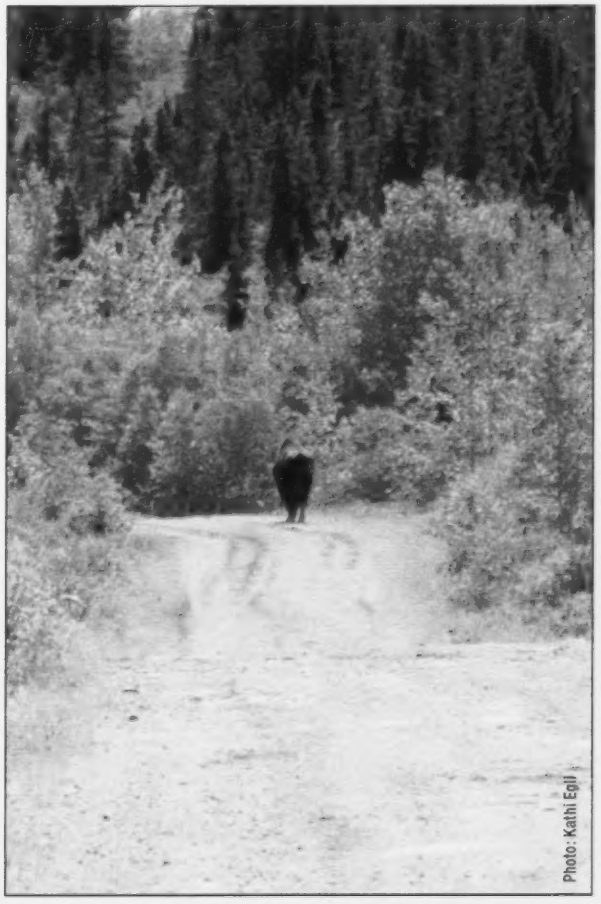
Photo: Kathi Egli

Photo: Matthew Wright

Management Goals, Objectives & Tasks

While the health of the herd and its range are key to the long-term viability of wood bison on the landscape, the overall goal for the conservation and management of the Aishihik herd should be for its ecological restoration (sensu Sanderson et al. 2008). Ecological restoration of the Aishihik herd should be evaluated not only on the number of wood bison and the intactness of the range, but also on whether bison are contributing to ecological processes, and on whether they are integrated into the culture of local people and communities.

Hunting should continue to be the primary means of managing the numbers and distribution of the Aishihik Wood Bison Herd, avoiding permit hunt authorizations or limited-entry hunts where possible. The Yukon Wood Bison Technical Team and the Bison Management Committee provide the best means of implementing this plan and its goals. A primary role for them will be to consider different approaches and management tools in meeting the Plan goals.

GOAL 1: Ensure the long-term viability of the Aishihik Wood Bison Herd

Objective 1: **Maintain the Aishihik Wood Bison Herd at or near 1000 bison post hunt.**

Objective 2: **Monitor and promote the genetic diversity of the Aishihik herd.**

Objective 3: **Ensure the genetic purity of wood bison in Yukon.**

Objective 4: **Protect wood bison from diseases of concern.**

Objective 1:
Maintain the Aishihik Wood Bison Herd at or near 1000 bison post hunt.

The target population size considers biological and social concerns as well as public input. The target is an increase from that of the 1998 Yukon Wood Bison Management Plan which recommended 500 animals and was based on advice from the National Wood Bison Recovery Team. Recent modeling suggests populations should contain at least 1000 animals to be viable over the long term. The 2012 population target considers this information and the fact that the current population is estimated at more than 1300 animals. It also considers that there are pending assessments and outstanding concerns about the impacts of bison and their hunters on other species and their habitat. The current target has been set with full knowledge that it will be challenging to achieve within the five year life of this plan, given the current population size and harvest rates. The current bison management advisory structures (Yukon Wood Bison Technical Team and Bison Management Committee) are tasked with considering and recommending means of achieving the population target through the existing adaptive management framework.

⇨ **Task 1. Conduct regular population surveys**

Regular population censuses track the population size and trends of the herd. Population surveys do not need to be conducted annually, however they should be performed with the sufficient scientific rigor to provide accurate population counts. It is recommended that mark-resight methodology be employed to census the herd every two years, where possible.

Demographic variables (e.g., calving and recruitment rates, sex ratios, and mortality) also need to be closely monitored to enable population modelling and the determination of annual sustainable harvest yields. Annual calving and recruitment surveys provide this information, while regular radio-telemetry monitoring helps to determine adult survival rates. About 30 to 40 radio-collared wood bison should serve as a reasonable sample size for survival monitoring and facilitate calving and recruitment surveys. Development of a protocol for monitoring calf survival rates to determine cause-specific mortality would support monitoring predation and recruitment rates.

⇨ **Task 2. Model the population dynamics of the Aishihik herd**

Population modeling will support the assessment of long-term population viability and the determination of the annual allowable harvest (AAH) under different harvest management regimes. It can be a key component in developing harvest management regimes that support the current adaptive management framework for the Aishihik herd. Population modeling will be dependent on reliable and current demographic data as outlined in Task 1 (above). On-the-ground data derived from individuals familiar with the herd should be incorporated into modeled scenarios, where possible. Population models should be updated and revisited regularly as new data becomes available.

Objective 2:
Monitor and promote the genetic diversity of the Aishihik herd

To ensure the long-term viability of the Aishihik herd, genetic diversity should be evaluated and, if deemed necessary, improved through genetic enhancement. As well, Yukon's wood bison may be a valuable source for genetic material to augment the genetic diversity of wood bison herds in other jurisdictions. Thus, wood bison from Yukon should assist national programs to bolster the genetic diversity of other herds, where desirable and feasible.

⇨ **Task 1. Assess the genetic diversity of the Aishihik herd**

Where feasible, Yukon should participate in periodic national efforts to assess the genetic diversity of wood bison in Canada. These data will be useful for deriving management prescriptions for genetically limited herds. Regular collection and storage of genetic samples from Yukon herds would support immediate or future analyses. Wood bison hunters and field operations represent two potential means of obtaining samples from the Aishihik herd; these should be further promoted.

⇨ **Task 2. Enhance the genetic diversity of the Aishihik herd, if necessary**

In collaboration with the National Wood Bison Recovery Team and managers of wood bison populations in other jurisdictions, it should be determined through genetic monitoring studies if the promotion of genetic diversity among wood bison herds is needed for the long-term viability of wood bison. If it is determined that genetic diversity needs to be improved for the Aishihik or other wood bison herds, Yukon could participate in national genetic enhancement projects. Means to accomplish this task need to be explored by both the Yukon Wood Bison Technical Team and the National Bison Recovery Team where Yukon wood bison are concerned.

Objective 3:
Ensure the genetic purity of wood bison in Yukon

Hybridization with plains bison poses a significant threat to wood bison (Wilson and Strobeck 1999; Ruckhstal 2000; Gates et al. 2001). Wood bison conservation efforts would be seriously compromised should Yukon's wood bison population become contaminated with plains bison genes. Movements and transplants of plains bison in Yukon need to be regulated for conservation purposes. As well, free-ranging wood bison in Yukon need to be restricted to areas where they will not likely intermingle with plains bison in other jurisdictions.

⇨ **Task 1. Support regulations to keep plains bison out of Yukon**

It is recommended that plains bison, either free-ranging or captive, not be permitted within Yukon, and that existing regulations to prohibit plains bison be sustained.

⇨ **Task 2. Ensure development of a protocol for bison that are transported through Yukon**

Occasionally, plains bison or wood bison are transported through Yukon, enroute to or from Alaska. A protocol is needed to address potential hybridization threats from transport of plains bison through Yukon, to free-ranging wood bison. This protocol should be developed in collaboration with the relevant federal and territorial government agencies. The intent of the protocol should be adequately communicated to jurisdictions that issue import and export permits.

⇨ **Task 3. Establish and maintain a Bison Control Area**

Four free-ranging herds of introduced plains bison exist in Alaska. To prevent genetic mixing of plains bison from the Delta herd in Alaska and wood bison of the Aishihik herd in Yukon, it is recommended that a Bison Control Area be maintained in western Yukon. No bison should be allowed between the White River and the Alaska/Yukon border. Bison encountered in this zone should be removed, as per an approved contingency protocol. Removals of bison from the Bison Control Area could be factored into the harvest allotment of that year. Discussions with relevant First Nations, such as White River First Nation, on the establishment and implementation of a Bison Control Area are required, along with U.S. authorities.

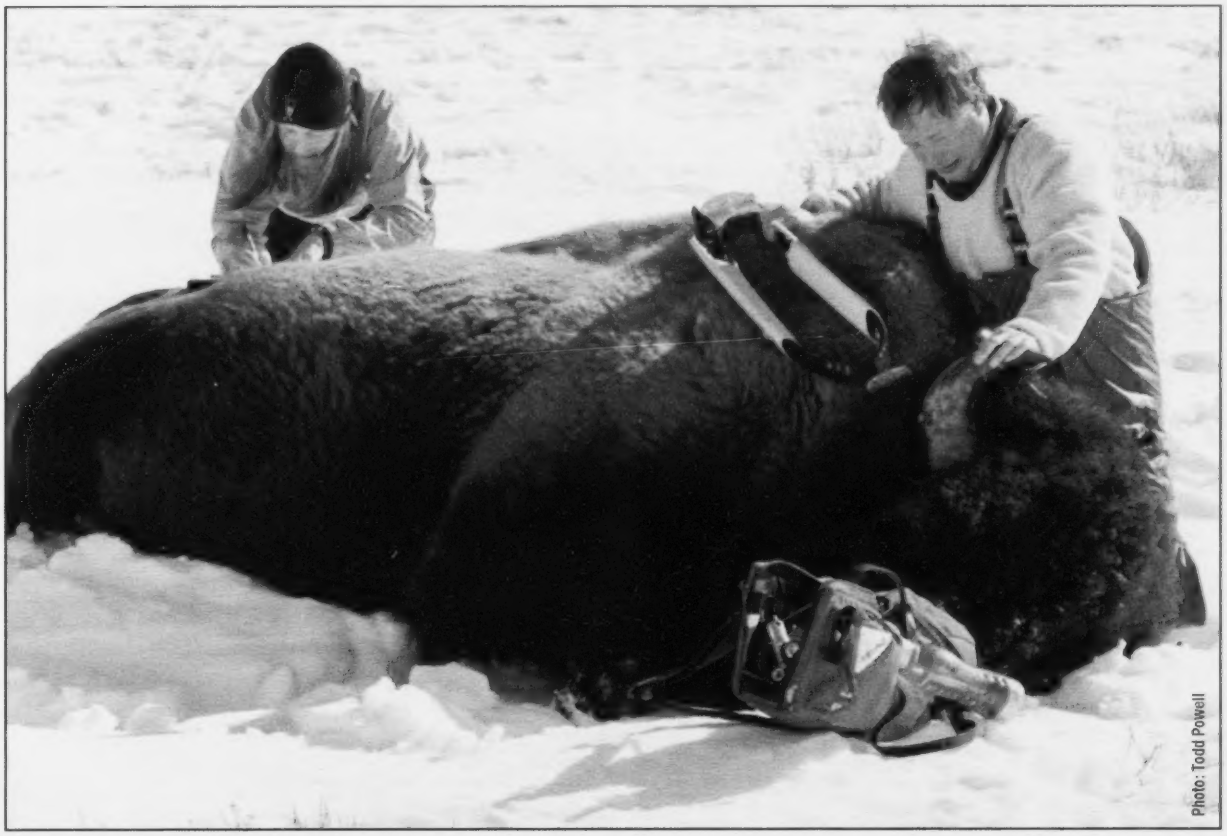

Photo: Todd Powell

Objective 4:
Protect wood bison from diseases of concern

In other areas, wood bison conservation has been seriously hampered by disease issues; the primary diseases being tuberculosis, brucellosis, and anthrax. A chief objective of the National Wood Bison Recovery Plan (Gates et al. 2001) is to maintain the free-ranging herds in a relatively "disease-free" state. Maintaining viable herds of wood bison in Yukon implies that the herds are protected from diseases of concern. A contingency plan for protecting the Aishihik herd from diseases of concern should be developed in conjunction with partners and affected stakeholders.

⇨ Task 1. Maintain knowledge of diseases of concern for wood bison

While tuberculosis, brucellosis, and anthrax have been the diseases of most concern in the recent past (Gates et al. 2001), other diseases such as Johne's and Bovine Viral Diarrhoea (BVD) have also been the cause of recent concern. Through linkages to the National Wood Bison Recovery Team, Canadian Cooperative Wildlife Health Centre, Canadian Food and Inspection Agency, and other agencies, the Yukon Wood Bison Technical Team will endeavour to remain current on diseases of concern to bison.

⇨ Task 2. Monitor wood bison for diseases of concern

Through representation on the National Wood Bison Recovery Team, the Yukon Wood Bison Technical Team can participate in the development of disease monitoring protocols for wood bison. Where Yukon wood bison are concerned, the Yukon Wood Bison Technical Team will provide reviews and recommendations on the national protocol. Testing of free-ranging wood bison for diseases of concern will be undertaken on an ad hoc basis where the opportunity to obtain the appropriate samples (e.g., blood and tissue) becomes available through field operations, import and permit requirements, and voluntary submissions by bison hunters. Results of all disease testing will be communicated to both the Yukon Wood Bison Technical Team and the National Wood Bison Recovery Team in a timely fashion.

⇨ Task 3. Develop a contingency plan for dealing with a disease of concern being found in wood bison

In cooperation with relevant territorial and federal agencies (e.g., Yukon Agricultural Branch, Canadian Food and Inspection Agency), and territorial stakeholders, develop a contingency plan for containing and handling an emergent disease issue among free-ranging or captive wood bison in Yukon. An emergency response should be contained within the contingency plan.

⇨ Task 4. Recommend a zone where no new wood bison farms are permitted

Game farms housing wood bison, and livestock or other game animals (particularly bovids), may pose a significant threat of disease transmission to free-ranging wood bison. It is recommended that a zone where no new wood bison game farms be permitted within the range of the Aishihik herd be identified and established in regulations of the Yukon Wildlife Act. Consideration should be given to keeping other new livestock and game farm facilities out of the zone. Consultation on the boundaries of the zone may be required.

⇨ Task 5. Prevent contact between free-ranging and captive wood bison

Contact between free-ranging wood bison of the Aishihik herd and captive wood bison should be discouraged to prevent the potential for disease transmission amongst the two populations. Development of a process is needed to minimize, if not eliminate the potential for contact and would incorporate a procedures that describes the actions to be taken in the event of a free-ranging wood bison frequenting the wood bison ranch, or an escaped bison from the ranch.

⇨ Task 6. No imports of wood bison allowed without completion of a risk assessment

Due to the risk of disease transmission to free-ranging wood bison herds in Yukon, it is recommended that existing mechanisms (e.g., *Wildlife Act*, Yukon Environmental and Socio-economic Assessment Board) be used to not allow wood bison to be imported into Yukon, other than for approved conservation purposes. An example of an approved conservation purpose would be the population augmentation or genetic enhancement of the Aishihik herd. All proposals for importation of wood bison that are to remain in Yukon should be subject to a risk assessment that puts conservation of the disease-free status of the Aishihik herd as the primary goal.

GOAL 2: Provide opportunities for human use and appreciation of wood bison

Objective 1: Hunting is the main tool for managing the population size and distribution of bison.

Objective 2: Promote wood bison viewing opportunities.

Objective 3: Increase public appreciation of wood bison.

Objective 1:
Hunting is the main tool for managing the population size and distribution of bison.

Hunting is currently the primary tool to manage for the population objectives of the Aishihik Wood Bison Herd. Bison are listed as a threatened species in Canada - a status that in many cases would preclude hunting. In Yukon, however, special hunting opportunities exist because of the current size of the Aishihik herd. These opportunities should be provided for in a manner that is consistent with the other goals and objectives of this management plan. Whenever possible, Yukoners would prefer an open hunt to one that is managed with permits. Harvest management is best done using an adaptive management framework, based upon annual recommendations from the Yukon Wood Bison Technical Team and the Bison Management Committee and upon periodic recommendations from the Yukon Fish and Wildlife Management Board.

⇨ **Task 1. Annually determine the allowable harvest of the Aishihik herd based on current information and population modeling**

The Yukon Wood Bison Technical Team will use annual population modeling to assist in determining the number of wood bison allowed to be sustainably harvested. Development of population viability models will help to predict the long-term effects of various harvest scenarios.

⇨ **Task 2. Ensure that hunters have current information about wood bison harvest methods and management issues**

The wood bison hunter education training program is an effective means of providing training on appropriate wood bison hunting techniques such as sex and age-class determination, optimal ballistics, and preferred shot placement. This course very likely contributes to decreasing wounding losses and meat wastage. As well, the course is an excellent opportunity for wood bison hunters to become more familiar with the natural history and special conservation significance of wood bison. It is recommended that this course continue to be offered for all wood bison permit holders. Ways and options for First Nations becoming more engaged in the development and delivery of the course need to be explored.

As well, exploration of alternative methods for delivering information to wood bison hunters is needed, including the development of brochures, pamphlets, or multi-media applications. These should cover, at minimum, the same type of information usually discussed in the wood bison hunter education courses.

⇨ **Task 3. Engage hunters in the collection of biological samples**

Hunters can play a large role in monitoring the population, health and disease status of wood bison in Yukon. The biological submissions of the lower incisor bar (jaw and teeth) should be continued as a requirement of permit holders. Hunters should also be periodically asked to submit information on their hunting effort and to submit a small genetic sample, where required. Voluntary submission of biological samples for disease testing should be encouraged. The wood bison hunter education course is an excellent venue for teaching hunters how to collect the required and requested samples and to explain the importance of this information. The return of results back to hunters is important for the long-term success of a program that relies on voluntary sample submission.

⇨ **Task 4. Monitor harvest statistics and communicate results to the public**

The Yukon Wood Bison Technical Team should conduct a formal analysis of the sex and age class of wood bison taken by hunters and the amount of effort expended by successful and non-successful hunters. This information will provide guidance in population modeling and harvest allocations. Results of annual harvest should be communicated to the public through the Yukon Hunting Regulations Summary and other communication materials (e.g., radio, newsletters, newspaper).

⇨ **Task 5. Explore options to increase success rates of wood bison harvesting.**

Hunting continues to be the primary means of managing population size and range and many Yukoners support the opportunity to harvest bison. The Yukon Wood Bison Technical Team will explore and recommend options to increase hunter success rates as warranted. These considerations may include but are not limited to: a change in hunting season for bison (e.g., including a fall hunt), an incentive for harvesting cow bison, a reduction in the tag fee, and removing or adjusting the 72 hour mandatory harvest reporting requirement.

Objective 2:
Promote wood bison viewing opportunities

Opportunities to view wildlife are an important component of Yukon's tourism industry and are cherished by residents. As a relatively accessible population, the Aishihik herd can, in some seasons, provide outstanding wildlife viewing opportunities, with the Aishihik Road providing good access to the herd for viewing.

⇨ **Task 1. Continue to provide and improve upon wildlife viewing opportunities for wood bison**

Wood bison should be a focal species for Environment Yukon's wildlife viewing program. Information about the natural history of wood bison, along with the collaborative efforts to restore and manage the Aishihik herd, should be the focus of bison viewing initiatives.

⇨ **Task 2. Establish and maintain wood bison interpretive sites**

Interpretive sites and panels within the range of the Aishihik herd should be developed in consultation with the local First Nations and communities and could provide detailed information on wood bison biology, identification, and conservation. The content and design of the panel display should be produced in cooperation with First Nations and reviewed by the Yukon Wood Bison Technical Team.

Objective 3:
Increase public appreciation and knowledge of wood bison

The relative accessibility of the Aishihik herd provides the public with the opportunity to learn about a species with special conservation status, both in Yukon and nationally. Opportunities to view wood bison and learn about the herd can contribute to community support for management actions. Youth participation in these activities is a component of broad community support, with benefits to herd management and to youth directly. Methods to increase public appreciation include the distribution of information about herd management, communication of results of scientific and local information surveys, presentations in schools about the bison management and related projects, and providing information about bison to local residents through programs run by First Nations and Renewable Resources Councils.

⇨ **Task 1. Produce and distribute information about wood bison**

Information on wood bison in Yukon needs to be distributed to local communities, First Nations, wood bison hunters, and the general public. Brochures, newsletters, and internet materials can be effective means to distribute this information and need to be explored. These materials can communicate key management direction (i.e., this plan and the forthcoming National Recovery Strategy for Wood Bison in Canada), the history of conservation status and efforts, and the natural history of wood bison. Printed materials should reflect current herd size and distribution, hunting regulations, and promote activities of interest to the public (e.g., spring school bison hunts). It is recommended that an annual newsletter be produced to transmit current biological information and management issues to the bison hunters and the general public. Electronic brochures and newsletters may be posted on Yukon Fish and Wildlife Management Board's website.

⇨ **Task 2. Continue programs to provide information to schools about wood bison in Yukon, and continue to promote school bison hunts**

School bison hunts have been a successful way to involve Yukon school-age children, local residents and agency staff in the permitted harvest since 1999. Each year permits are available to Yukon schools to participate in the hunt. The time on the hunt is preceded by preparations in the classroom and by the completion of a hunter education and firearms safety course, administered by Environment Yukon. Following the hunt, reports and other written work contribute to a comprehensive learning experience for students. The popularity and success of these hunts in exposing school-age children to a winter wilderness experience has been widely heralded. Continuing this opportunity can contribute to community support for management.

GOAL 3: Acknowledge and address conflicts between bison and humans

Objective 1: Reduce the potential for bison-vehicle collisions

Objective 2: Address local concerns about the social, cultural, and economic impacts of wood bison reintroduction

Objective 1:
Reduce potential bison-vehicle collisions

The southern limit of the range of the Aishihik herd extends to the Alaska Highway. In particular, the Aishihik herd occasionally uses the section of the highway between the Mendenhall River and village of Canyon. There are ongoing concerns from highway travelers about the danger of wood bison being on or adjacent to the highway which need to be addressed. It is assumed that bison are attracted to highway right-of-ways because of the available forage that they provide. Experience from other jurisdictions has unfortunately shown that bison along the highway can result in bison-vehicle collisions of a serious nature. Every effort must be made to not let the Aishihik herd become accustomed to using the Alaska Highway.

⇨ **Task 1. Encourage the use of roadside vegetation management practices that do not produce attractive forage for wildlife**

Highway corridor vegetation management practices in the range of the Aishihik herd should avoid reseeding with vegetation that may attract and hold wood bison close to the highway. Vegetation management practices that are not attractive to wood bison, including reseeding, need to be pursued in cooperation with the Yukon Department of Highways and Public Works and affected First Nations and Renewable Resources Councils.

⇨ **Task 2. Develop a means for dealing with wood bison frequenting the Alaska Highway and alerting the public of the safety concern**

Development of a protocol is needed to address and communicate an emergent hazard of wood bison frequenting the Alaska Highway. This protocol could include courses of action for public safety announcements and roadside hazard signage, and would need to be cooperatively developed and implemented with the Yukon Department of Highways and Public Works.

Experience in Yukon and beyond has shown that the best course of action for moving wood bison off the highway is lethal control. Generally, a group of wood bison will leave the area only if they decide to do so, or if an individual animal or two are lethally removed.

Objective 2:
Address local concerns about the social, cultural and economic impacts of the wood bison reintroduction

For future support and appreciation for the recovery efforts for wood bison there is a priority need to identify and address local concerns about the impacts of transplanted wood bison on human and ecological communities. The social, cultural and economic impacts of the wood bison reintroduction have previously not been well defined.

⇨ **Task 1. Conduct a socio-economics impact study**

This study is recommended to identify First Nations' interests and concerns regarding the wood bison, such as the impacts in traditional communities and at cultural sites. The outcome of the study will describe these impacts and in turn, inform adaptive management practices and potential amendments to this plan. A study focussed on Champagne and Aishihik First Nations began in 2008 and was completed in 2011. Now that the report is available, the parties will jointly review, discuss and identify any next steps required.

⇨ **Task 2. Address property damage issues as they arise**

There is currently no policy in place to address compensation claims for property damage. Compensation claims and removal or relocation of animals will be dealt with on a case-by-case basis by the Yukon government and the affected property owners until such time that policy direction from the Yukon government is approved.

⇨ **Task 3. Explore, implement, and evaluate techniques to exclude wood bison from sites of cultural significance**

Methods to keep Aishihik wood bison out of culturally significant sites, such as cemeteries, need to be explored. Given the importance and sensitivities attached to these sites, the First Nations should take the lead on identifying techniques that are acceptable. Initiatives to protect some key cemeteries in Hutshi and Aishihik villages have already been undertaken.

GOAL 4: Address land use and ecosystem considerations on the range of the Aishihik Wood Bison Herd

Objective 1: Delineate and manage critical habitat for the Aishihik herd

Objective 2: Monitor and manage for range expansion in areas where bison are not acceptable

Objective 3: Monitor the effects of this bison reintroduction on other species and ecosystems

Objective 1: Delineate and manage critical habitat for the Aishihik herd

The federal *Species at Risk Act* legally requires that residences and critical habitat be protected from destruction for all listed threatened and endangered species, including wood bison. This part of the plan lays out a framework for filling knowledge gaps on range and habitat use of the Aishihik herd, and delineating and designating critical habitat.

⇨ **Task 1. Identify critical habitat of the Aishihik herd**

Several years of aerial survey, radio-telemetry, and local and aboriginal knowledge information may be used to delineate important habitats. Further collection and collation of this information will assist in the delineation of critical habitat of the Aishihik herd. This knowledge could come from both scientific study and the documentation of field observations by First Nations and other persons spending time in the herd's range. Protocols for delineating critical habitat should be acceptable to the National Wood Bison Recovery Team.

⇨ **Task 2. Designate critical habitat areas for the Aishihik herd and provide management guidelines for those critical habitat areas**

Where critical habitat areas for bison are determined, these will be forwarded to the responsible federal Minister for consideration for inclusion in the federal Species at Risk Act. Concurrently, the Yukon Wood Bison Technical Team will prepare management guidelines for wood bison critical habitat in Yukon. The recommended guidelines will identify activities that should be limited and those that may need further review or authorization within designated critical habitat areas for wood bison. Guidelines developed at a national level may be used in place of those specific to the Aishihik herd, if appropriate, and after review by the Yukon Wood Bison Technical Team, Environment Yukon, and affected First Nations. Presently, it is anticipated that there will be few extraordinary prohibitions on wood bison critical habitat because the species does not appear either limited by habitat or sensitive to human developments.

Objective 2:
Monitor and manage for range expansion in areas where bison are not acceptable

Community concerns about the expansion of wood bison into new areas need to be addressed. Since the reintroduction of wood bison to the Nisling River area, the range of the Aishihik herd expanded into areas that were not anticipated. This range expansion has brought bison into conflict with landowners, highway traffic and has caused other concerns. Communities are concerned about the impact of wood bison on other wildlife populations and ecosystems. First Nations want to discourage wood bison from parts of their traditional territory until the effects of wood bison on the land and ecosystems is better known. Monitoring range use patterns over the long-term is necessary to effectively manage the Aishihik herd and to limit range expansion into areas where the presence of wood bison is not socially acceptable.

⇨ Task 1. Monitor for range expansion of wood bison

Monitoring the range expansion of the Aishihik Wood Bison Herd can be done through tracking movements of radio-collared animals. Most of the expansion appears to be initiated by bulls repeatedly travelling into new areas and then taking smaller groups of cows with them. This eventually leads to "satellite" groups that seem to establish in new areas. In addition to formal monitoring, the establishment of a wood bison sighting hotline, or other mechanism, could provide the public an opportunity to report observations of wood bison in Yukon outside their normal range. First Nations and Renewable Resources Councils can assist by coordinating and reporting local residents' sightings to the Yukon Wood Bison Technical Team.

⇨ Task 2. Establish a Bison Free Zone where bison are not allowed

In response to community concerns to limit range expansion by wood bison until the social and environmental impacts are better understood and mitigated, it is recommended that a Bison Free Zone be established, where bison are not allowed to extend their range. It is recommended that the Aishihik herd's range be confined by implementing a Bison Free Zone east of the North Klondike Highway, west of Kluane Lake, and south of the Alaska Highway. It is recommended that bison be removed from the proposed Bison Free Zone, where ethically feasible and using methods recommended by the Yukon Wood Bison Technical Team and the Bison Management Committee.

Photo: Todd Powell

Objective 3:
Monitor the effects of this bison reintroduction on other species and ecosystems

Local communities are concerned that the Aishihik herd may be affecting other wildlife, particularly moose (*Alces americanus*), woodland caribou (*Rangifer tarandus*), Dall's sheep (*Ovis dalli dalli*), and muskrats (*Ondatra zibethicus*). For moose, woodland caribou and Dall's sheep, the concern is that wood bison will out-compete these species for food and habitat, and/or otherwise disturb these species and cause them to abandon their range. For muskrats, the concern is that bison damage pushups. Substantial research on the question of competition between wood bison and woodland caribou in the Aishihik range was done by Fischer and Gates (2005). This study concluded that there was little potential for competition because caribou and bison had different diets and were segregated by elevation. While useful, the analysis by Fischer and Gates (2005) was based on data collected early in the release of wood bison, and prior to them using alpine habitats, areas favoured by woodland caribou and Dall's sheep. This and other gaps in the early research by Fischer and Gates (2005; e.g., no consideration of moose, and analyses restricted to winter), necessitate a research program to build upon their early work.

Additionally, relict boreal grasslands are a key ecological feature of the Aishihik herd's range (e.g., Vetter 2000). Several rare plant species are found in this remnant plant community (Vetter 2000; B. Bennett, Environment Yukon, pers. comm., 2010). Concern about the impact of wood bison trampling and grazing of these remnant boreal grasslands and wet sedge meadows necessitates an investigation to establish the extent of the damage done by bison.

If community support for the Aishihik Wood Bison Herd is to be increased, then these concerns need to be addressed, through a suite of ecological studies. In recognition of the concerns, the Yukon Wood Bison Technical Team established a sub-committee called the Bison Impact Research Group (BIRG; led by Champagne and Aishihik First Nation, Environment Yukon, and Environment Canada) in July 2008 to initiate parallel studies on the socio-economic and environmental impacts of the Aishihik herd. The socio-economic study is being led by a researcher from the University of Saskatchewan and a final report is now available. The ecological studies are being led by researchers from the University of Alberta and results will be forthcoming in 2013.

⇨ Task 1. Continue to monitor moose and woodland caribou populations in the range of the Aishihik Wood Bison Herd

Monitoring moose and woodland caribou populations in the range of the Aishihik herd will help to identify population changes. Both scientific survey and local information can detect significant changes in moose and woodland caribou populations. Changes to these populations should be communicated to the Yukon Wood Bison Technical Team.

Community-based fish and wildlife work plans have identified some of these concerns in the past, and will continue to be an important means for communities to communicate their concerns to the Yukon Wood Bison Technical Team.

⇨ Task 2. Conduct studies on the potential impact of wood bison on other wildlife

Studies to further the work of Fischer and Gates (2005) are needed such as research on the diet, habitat and spatial overlap of the Aishihik Wood Bison Herd on local moose, woodland caribou, and Dall's sheep populations. A preliminary investigation on the potential impact of wood bison on muskrats in late-winter would also be important for addressing community-based concerns.

Field research on the potential niche overlap between wood bison, woodland caribou, and moose began in late 2008, and results are expected in 2013.

⇨ Task 3. Investigate and monitor the impact of wood bison on selected vegetation communities

An investigation and monitoring of the impact that wood bison trampling and grazing has on vegetation communities in the herd's range would address this long-standing community-based issue. This investigation should focus on remnant boreal grasslands as well as high altitude areas (where sheep and bison co-exist), on the north end of Aishihik Lake and along the West Aishihik River, as well as in wet sedge meadow complexes. Both of these habitat types are relatively rare on the landscape and heavily used by wood bison.

Results of the studies and monitoring of vegetation communities should be communicated to the Yukon Wood Bison Technical Team as they become available.

Literature Cited

BANFIELD, A. W. F. AND N. S. NOVAKOWSKI. 1960. The survival of the wood bison (*Bison bison athabascae Rhoads*) in the Northwest Territories. Natural History Papers No. 8. National Museum of Natural Sciences (Canadian Museum of Nature), Ottawa, Ontario.

FARNELL, R., P.G. HARE, E. BLAKE, V. BOWYER, C. SCHWEGER, S. GREER, AND R. GOTTHARDT. 2004. Multidisciplinary investigations of alpine ice patches in southwest Yukon, Canada: paleoenvironmental and paleobiological investigations. Arctic, 57:247-259.

FISCHER, L. A. AND C. C. GATES. 2005. Competition potential between sympatric woodland caribou and wood bison in southwestern Yukon, Canada. Canadian Journal of Zoology, 83: 1162-1173.

FULLER, W. A. 1950. Aerial census of bison in Wood Buffalo National Park and vicinity. Journal of Wildlife Management, 12: 445-451.

FULLER, W.A. 2002. Canada and the "Buffalo", *Bison bison*: A tale of two herds. Canadian Field-Naturalist, 116:141-159.

GATES, C. C., R. O. STEPHENSON, H. W. REYNOLDS, C. G. VAN ZYLL DE JONG, H. SCHWANTJE, M. HOEFS, J. NISHI, N. COOL, J. CHISHOLM, A. JAMES, AND B. KOONZ. 2001. National Recovery Plan for the Wood Bison (*Bison bison athabascae*). National Recovery Plan No. 21. Recovery of Nationally Endangered Wildlife (RENEW); Ottawa, Ontario.

GEIST, V. 1991. Phantom subspecies: the wood bison *Bison bison "athabascae"* Rhoads 1897 is not a valid taxon, but an ecotype. Arctic, 44:283-300.

GUTHRIE, R.D. 1970. Bison evolution and zoogeography in North America during the Pleistocene. Quarterly Review of Ecology, 45:1-15.

LARTER, N. C., A. R. E. SINCLAIR, T. ELLSWORTH, J. NISHI, AND C. C. GATES. 2000. Dynamics of reintroduction in an indigenous large ungulate: the wood bison of northern Canada. Animal Conservation, 3: 299-309.

LARTER, N.C., D.G. ALLAIRE, AND T.S. JUNG. 2007. Population survey of the Nahanni Wood Bison population, March 2004. GNWT Manuscript Report No. 176; Yellowknife, Northwest Territories.

LOTENBERG, G. 1996. History of wood bison in the Yukon: a re-evaluation based on traditional knowledge and written records. Yukon Department of Renewable Resources; Whitehorse, Yukon.

NATIONAL WOOD BISON RECOVERY TEAM. In review. National Recovery Strategy for Wood Bison in Canada. Environment Canada; Ottawa, Ontario.

SANDERSON E.W., K.H. REDFORD, B. WEBER, K. AUNE, D. BALDES, J. BERGER, D. CARTER, C. CURTIN, J. DERR, S. DOBROTT, E. FEARN, C. FLEENER, S. FORREST, C. GERLACH, C.C. GATES, J.E. GROSS, P. GOGAN, S. GRASSEL, J.A. HILTY, M. JENSEN, K. KUNKEL, D. LAMMERS, R. LIST, K. MINKOWSKI, T. OLSON, C. PAGUE, P.B. ROBERTSON, AND B. STEPHENSON. 2008. The ecological future of the North American bison: conceiving long-term, large-scale conservation of wildlife. Conservation Biology, 22:252–266.

SHAPIRO, B., A.J. DRUMMOND, A. RAMBAUT, M.C. WILSON, P.E. MATHEUS, A.V. SHER, O.G. PYBUS, M.T.P. GILBERT, I. BARNES, J. BINLADEN, E. WILLERSLEV, A.J. HANSEN, G.F. BARYSHINIKOV, J.A. BURNS, S. DAVYDOV, J.C. DRIVER, D.G. FROESE, C.R. HARINGTON, G. KEDDIE, P. KOSINTSEV, M.L. KUNZ, L.D. MARTIN, R.O. STEPHENSON, J. STORER, R. TEDFORD, S. ZIMOV, AND A. COOPER. 2004. Rise and fall of the Beringian steppe bison. Science, 306:1561-1565.

SOPER, J.D. 1941. History, range, and home life of the northern bison. Ecological Monographs, 11:347-412.

ROWE, M. 2007. Nordquist wood bison inventory. British Columbia Ministry of Environment; Fort St. John, British Columbia.

RUCKSTUHL, K.E. 2000. Updated COSEWIC status report on the wood bison *Bison bison athabascae* in Canada. Committee on the Status of Endangered Wildlife in Canada; Ottawa, Ontario.

VAN ZYLL DE JONG, C. G., C. GATES, H. REYNOLDS, AND W. OLSON. 1995. Phenotypic variations in remnant populations of North American bison. Journal of Mammalogy, 76:391-405.

VETTER, M.A. 2000. Grasslands of the Aishihik-Sekulmun Lakes Area, Yukon Territory, Canada. Arctic, 53:165-173.

WILSON, D.E., AND D.M. REEDER (editors). 2005. Mammal species of the world: a taxonomic and geographic reference (3rd ed), Johns Hopkins University Press; Baltimore, Maryland.

WILSON, G.A. AND C. STROBECK. 1999. Genetic variation within and relatedness among wood and plains bison populations. Genome, 42:483-496.

YUKON ELK MANAGEMENT PLANNING TEAM. 2008. Management plan for elk (*Cervus elaphus*) in the Yukon. Yukon Department of Environment; Whitehorse, Yukon.

YUKON DEPARTMENT OF RENEWABLE RESOURCES. 1998. Yukon bison management plan. Yukon Department of Environment; Whitehorse, Yukon.

Appendix A

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Notes: Not all individuals were part of the planning process in all years, or at the conclusion of the planning process. As such, those that were not part of the final reviews may not agree with all of the final outcomes. Names with an asterisk (*) were members of the Yukon Wood Bison Technical Team during the time the plan was developed.

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